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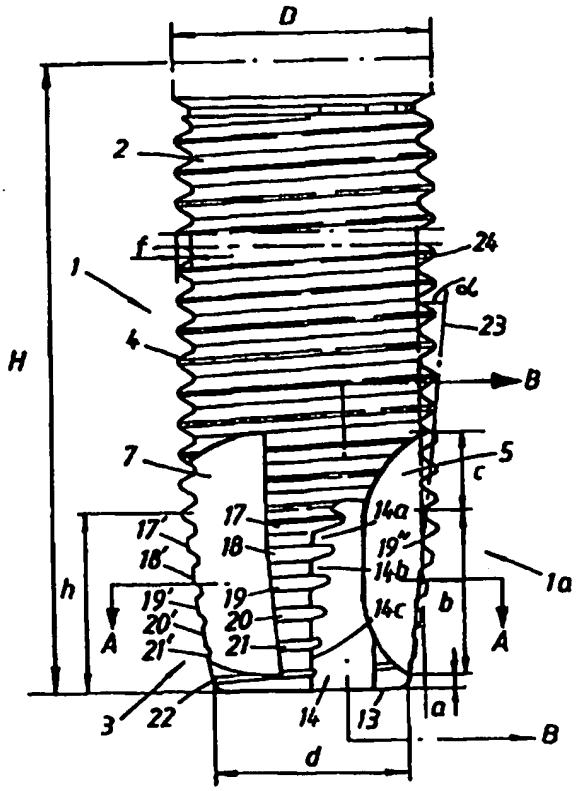
(54) Title: ANCHORING ELEMENT

(57) Abstract

An anchoring element (1) which is intended to be screwed into a hole made in dentine comprises a threaded part with a conical portion (3) and also one or more recesses (5, 6, 7) in order to form a cutting edge (8, 9, 10) in each recess. Thread-turn parts (17-21) starting from each cutting edge are lowered vertically (f) at the rear where they merge with a relief surface (14, 15, 16) arranged at a distance from each cutting edge. The relief surface is arranged on the conical portion (3) where it extends essentially parallel to (coincides with) a plane (15) tangential to the conical portion (3).



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TITLE

Anchoring element

TECHNICAL FIELD

The present invention relates to an anchoring element for screwing with a tightening torque into a hole which has been made in the dentine. The element comprises a threaded part which has a conical (threaded) portion and one or more recesses in order to form a cutting edge in each recess. Thread-turn parts starting from each cutting edge are lowered vertically at the rear (seen in the direction of rotation) where they merge with a relief surface which is arranged at a distance from each cutting edge and is intended to reduce said tightening torque for the element.

STATE OF THE ART

An element of the abovementioned type is already known through EP 0 530 160. The element consists of a self-tapping anchoring element which is to be screwed into a hole which has been made in the dentine. The element is to be capable of being used in both soft and hard dentine. In order to achieve good primary stability even in soft bone quality, the hole is often drilled in the dentine using a drill which has a small diameter in relation to the anchoring element. The surrounding soft bone material is then compressed when the anchoring element is screwed in. For hard bone, larger hole diameters are used than in the case of soft bone.

TECHNICAL PROBLEM

In order to provide for the abovmentioned functions, it is important that the anchoring element has good initial self-tapping properties, i.e. to make the anchoring element "make threads" in the hard surface

layer, the cortical bone, which surrounds the soft bone situated within. It is therefore unacceptable, in the case of small hole diameters in the dentine, to use elements with no or greatly reduced thread in the front conical part because the desired initial thread engagement is then made more difficult. It is also important, however, especially in the case of hard bone, to reduce the tightening torque, i.e. that the anchoring element has an effective relief function.

The invention aims to solve inter alia the abovementioned problems and proposes an arrangement for the conical, threaded portion which on the one hand increases the effective thread area and on the other hand provides relief functions where these are most required, i.e. where the clamping is greatest.

Along the periphery on the conical portion, each thread-turn can be considered to be lowered in the locations for the relief surfaces and the recesses. The remaining thread-turn sections around the periphery must be selected optimally according to the invention to achieve an effective initial self-tapping function. The invention solves this problem.

The heights of the thread turns above their bottom plane on the conical portion of the element can also be used in order to render the initial self-tapping property more effective. The invention solves this problem also.

SOLUTION

An anchoring element according to the invention can be considered to be mainly characterized in that each relief surface is arranged on the conical portion where it extends essentially parallel to (coincides with) a plane tangential to the conical portion.

In an advantageous embodiment, the thread in the conical portion is arranged so that the inner diameter of the thread is also conically arranged, i.e. the inner diameter of the thread gradually becomes smaller as the

tip is approached.

In an embodiment, the number of recesses, and therefore the number of relief surfaces also, is three. The three relief surfaces are parallel to or coincide with said tangential planes. Each relief surface is preferably essentially straight.

Each thread turn can be considered to consist of remaining thread-turn sections arranged at essentially the same mutual distance from one another along the periphery on the conical portion. The sector angle for each remaining thread-turn section is selected within the range 8-20°, preferably within the range 12-15°. The sector angles for the relief surfaces correspondingly have values within the ranges 5-15° and are preferably approximately 10°. Further developments of the invention emerge from the subclaims below.

ADVANTAGES

The depth of the relief surfaces in the conical portion defines the sector angles for the remaining thread-turn sections for each thread turn around the periphery on the conical portion. Optimum anchoring elements can then be produced for use in both soft and hard bone. The thread turns, which are provided with increasingly lower height towards the front end of the element, contribute to an effective initial self-tapping property where good initial guidance of the anchoring element is possible even in the hard bone. The cutting of the threads into the dentine is reduced further at the tip of the conical portion. At the same time, the threaded surface area on the conical portion can, in total, be increased compared with the previously known elements. The relief functions are obtained where they are of greatest use by their positioning on the conical portion, which contributes to keeping the tightening torque low, which in turn reduces the risk of overstressing tools and/or damage or even locking fast in the surrounding hard bone material. It is essential that

the anchoring element can be assigned the desired position or the desired optimum direction for the longitudinal axis of the element when it is screwed into the dentine.

DESCRIPTION OF THE FIGURES

A for the present proposed embodiment of an arrangement which has the significant characteristics of the invention is described below with simultaneous reference to the attached drawings in which

Figure 1 shows the anchoring element in a partial vertical section, in particular its lower parts with recesses and relief surfaces and also thread-turn parts,

Figure 2 shows the anchoring element according to Figure 1 in an end section along A-A according to Figure 1,

Figure 3 shows a portion of the anchoring element in Figure 1 in a vertical section along B-B according to Figure 1, and

Figure 4 shows in principle the application of the element to dentine in a vertical section.

DETAILED EMBODIMENT

In Figure 1, an anchoring element is shown by 1. The length of the element is shown by H and is preferably within the range 10-20 mm. The element has an upper straight cylindrical part 2 and a conical part 3. Both the cylindrical part and the conical part are made with a thread 4. The cylindrical part has a diameter D which may lie within the range 5-10 mm. The upper parts including the cylindrical part are previously known per se and will therefore not be described in greater detail here (refer to said EP specification). The conical part has a height h of 5-10 mm and it is essential in an embodiment that the total height H can be kept low, in which connection h may be 1/4-1/3 of the total height.

The conical part is specially shaped according to the invention and has an average diameter d in its lowest or outermost end of 4-6 mm.

In its lower parts, the anchoring element is provided with a number of recesses, in the exemplary embodiment three recesses 5, 6 and 7 (see also Figure 2). The recesses extend downwards in the conical part and are arranged in order to form cutting edges, in this case three cutting edges 8, 9 and 10. The element is rotated in the direction of rotation of the arrow 11, i.e. in clockwise direction around the longitudinal axis 12 of the element. The recesses extend, with parts in the cylindrical part, downwards into the conical part where they run out laterally from the element at a distance a above the end surface 13 of the element. The extension along the conical part is indicated by b and the extension in the cylindrical part is indicated by c. The extension b is 2-3 times greater than the extension c. At a distance from each cutting edge, see e.g. the cutting edge 10 in Figure 2, a relief surface 14 is arranged. The distance is indicated by d. In the present case, there are three relief surfaces 14, 15, 16 evenly distributed along the periphery on the conical part. The distances of the relief surfaces 15 and 16 from the edges 8 and 9 respectively are not specifically shown in the figure. The height of the relief surfaces corresponds essentially to the distance a + b in the figure and the relief surfaces are thus situated in the main only on the conical part 3.

In Figure 1, a number of thread-turn sections are indicated by 17, 18, 19, 20 and 21. Each thread-turn section has its greatest radius dimension R at the respective associated cutting edge and has a backwardly decreasing radius dimension (seen in the direction of rotation). At said distance d, the thread-turn sections merge with said relief surface.

A further feature of the embodiment shown is that the thread-turn sections are assigned an increasingly lower height the closer they are situated to the end

surface 13, cf. thread-turn sections 17', 18', 19', 20' and 21'. Thread height in this case means a distance f from the bottom parts 19'' of the thread to its upper parts 19'. Figure 1 shows that the thread height is greatest at the upper parts on the conical portion 3 and decreases gradually to the end of the element 13.

Each relief surface 14, 15 and 16 is preferably straight and extends in between the thread turns 17, 18, 19, 20 and 21 depending on their thread heights. In this connection, the relief surface portions can be indicated 14a, 14b, etc. An outer thread-turn section 22 only affects the respective relief surface to a limited extent. A front edge 14c on each relief surface is essentially parallel to or is inclined only slightly in relation to the vertical extension of the cutting edge (see view according to Figure 1).

In Figure 1, a tangential plane, which is assigned to the conical shape and extends at right angles to the figure plane according to Figure 1, is indicated by 23. The tangential plane 23 can also be considered to extend through the bottom parts 19'' of the thread-turn sections. In Figure 1, the longitudinal direction (parallel to the longitudinal axis 12) of the element is indicated by 24. An angle α therefore represents half the cone angle which is preferably selected within the range 2-10°, preferably the range 3-7°.

A tangential plane corresponding to the tangential plane 23, at the relief surface 15, is indicated by 25. The relief surface 15 coincides with the tangential plane 25 which is inclined according to the tangential plane 23 above, which therefore means that the relief plane is inclined within the values indicated for said angle α.

Corresponding inclinations apply for the relief surfaces 14 and 16. The invention differs essentially in this respect from the prior art in which the relief surfaces are parallel to the longitudinal axis 16 of the element.

In Figure 3, a tangential plane 26 is applied

over the thread-turn sections close to a cutting edge. The tangential plane 26 extends at right angles to the figure plane according to Figure 3. A longitudinal axis parallel to the central axis 12 is indicated by 27 and the inclination between the plane 26 and the axis 27 is indicated by angles β which are in this case of the order of magnitude of 5-20°, preferably 10-15°, and therefore represent the thread-height reduction together with half the cone angle.

In Figure 2, sector angles γ' and γ'' of a relief surface and a thread-turn section respectively are indicated.

In Figure 4, the element is shown by 28 and dentine parts in principle by 29, which dentine includes a hard (cortical) layer of dentine 29a. In the case of soft dentine, use is made of a hole 30 with a smaller hole diameter d' and, in the case of harder dentine, a hole 31 of greater hole diameter d''. It is easy to see the importance of initial good interaction between the element and the dentine for establishing an effective self-tapping principle.

The invention is not limited to the embodiment shown above as an example but can be subjected to modifications within the scope of the following patent claims and the inventive idea.

PATENT CLAIMS

1. Anchoring element (1) for screwing with a tightening torque into a hole (30, 31) made in the dentine (29) and comprising a threaded element with a conical portion (3) and one or more recesses (5, 6, 7) in order to form a cutting edge (8, 9, 10) in the respective recesses, thread-turn parts (17-21) starting from each cutting edge being lowered vertically (f) at the rear (seen in the direction of rotation 11) where they merge with a relief surface (14, 15, 16) which is arranged at a distance from each cutting edge and is intended to reduce said tightening torque for the anchoring element, characterized in that the relief surface (14, 15, 16) is arranged on the conical portion (3) where it extends essentially parallel to (coincides with) a plane (15) tangential to the conical portion (3).

2. Element according to Patent Claim 1, characterized in that the thread in the conical portion (3) is arranged so that the inner diameter of the thread (i.e. the bottom diameter 19'' of the thread turn) is also conically arranged, i.e. the inner diameter of the thread decreases gradually as the tip (the end 13 of the element) is approached.

3. Element according to Patent Claim 2, characterized in that the number of recesses, and therefore the number of relief surfaces, is three and in that the three relief surfaces (14, 15, 16) are parallel to or coincide with each of said tangential planes (15).

4. Element according to Patent Claim 1, 2 or 3, characterized in that each relief surface (14, 15, 16) is essentially straight.

5. Element according to any one of the preceding patent claims, characterized in that it is designed for application in both hard and soft dentine material (29).

6. Element according to any one of the preceding patent claims, characterized in that, on the conical portion (3), the thread-turn height (f) at each cutting edge (8, 9, 10) is designed so as to decrease gradually

in the direction of the end (13) of the element.

7. Element according to any one of the preceding patent claims, characterized in that it is designed with a comparatively short length (H), e.g. with a length which is selected within the range 10-20 mm.

8. Element according to any one of the preceding patent claims, characterized in that half the cone angle (α) for each relief surface (14, 15, 16) is selected within the range 2-10°, preferably within the range 3-7°.

9. Element according to any one of the preceding patent claims, characterized in that half the cone angle (β) for the upper parts (19') of the thread-turn parts close to each cutting edge on the conical portion (3) is selected within the range 5-20°, preferably within the range 10-15°.

10. Element according to any one of the preceding patent claims, characterized in that each thread turn around the periphery of the conical portion consists of remaining thread-turn sections (17-21) arranged at essentially the same distance from one another, and in that a sector angle (γ'') for each remaining thread-turn section is selected within the range 8-20°, preferably within the range 12-15°.

11. Element according to any one of the preceding patent claims, characterized in that each relief surface (14, 15, 16) has a sector angle (γ') within the range 5-15°, and is preferably approximately 10°.

12. Element according to any one of the preceding patent claims, characterized in that each relief surface (14, 15, 16) is lowered in the material of the conical portion and extends in part between (14a) the backwardly decreasing thread-turns.

Fig. 1

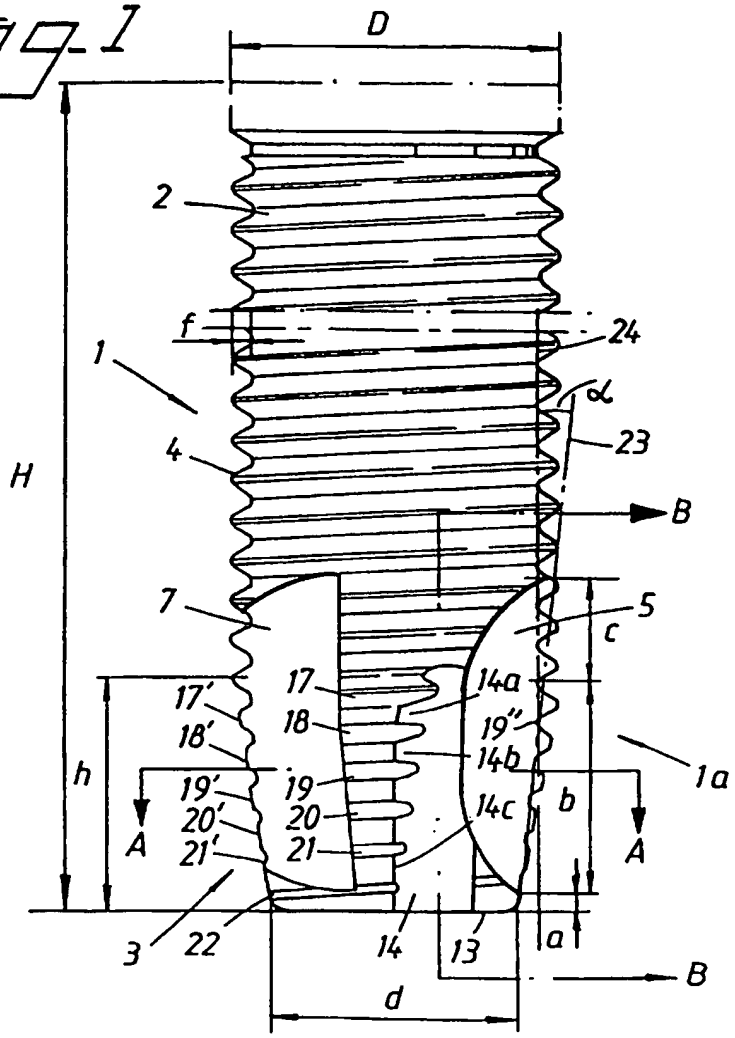

D
2
f
24
1
α
23
4
H
B
7
5
c
17
14a
17'
18
19''
18'
14b
1a
h
19'
19
14c
b
20'
20
A
A
21'
21
3
22
14
13
a
B
d

Fig. 2

A-A

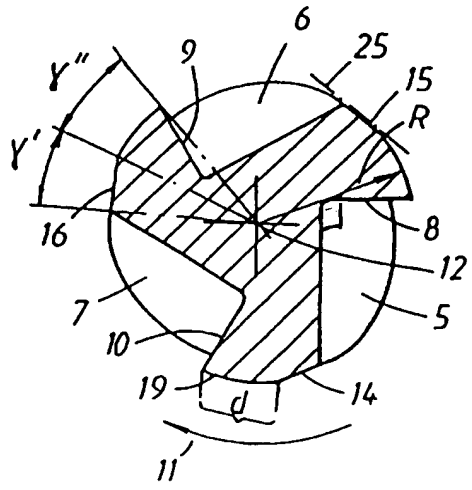

6
9
25
Y''
15
R
Y'
16
8
12
7
5
10
19
14
d
11

Fig. 3

B – B

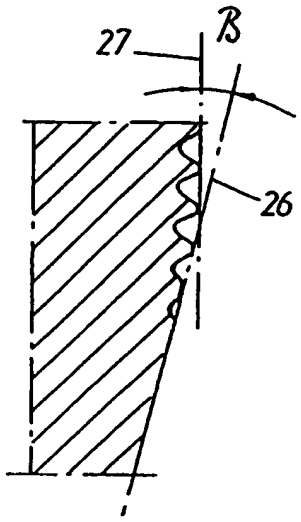
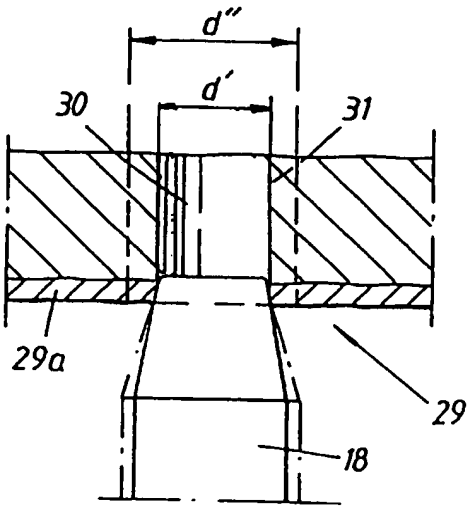


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/00790

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61C 8/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0530160 A1 (NOBELPHARMA AB), 3 March 1993 (03.03.93) -- --------	1-12

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INTERNATIONAL SEARCH REPORT

Information on patent family members

06/08/97

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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